Food Sovereignty: A Critical Dialogue

24 January 2014
International Institute of Social Studies (ISS), The Hague, The Netherlands

Conference Paper # 91

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Organized by:
ISS-Agrarian, Food & Environmental Studies (AFES), Initiatives in Critical Agrarian Studies (ICAS), Transnational Institute (TNI), Institute for Food and Development Policy/Food First, Land Deal Politics Initiatives (LDPI), *Journal of Peasant Studies*

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Conference paper for discussion at:

Food Sovereignty: A Critical Dialogue
International Colloquium
January 24, 2014

Convened by

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www.iss.nl/icas

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The Journal of Peasant Studies
www.informaworld.com/jps

ABSTRACT

Current agricultural regimes are still rather successfully suppressing big-push developments of ecological agriculture around the globe (McMichael, 2009). The weight of well-documented environmental, sociopolitical, technological and economic challenges to these regimes, however, will intensify during the next decades. The confluence of these challenges can be suspected to induce the political will in at least one national government to embark on a big push for an alternative agriculture. Anticipating that situation, agroecology should develop a sub-dialogue on the implications of national-scale implementation with relatively higher endowments and possibilities on the legal and executive layers. This paper argues that the re-construction of big push theory outside and against the 'modernization' paradigm that once produced it is possible, and that formulation and discussion of big-push strategies could reclaim a space within critical agrarian studies. Well-researched proposals by academics would help agrarian movements express and discuss their cause on a material basis. The paper re-constructs, from within agroecology, the concepts of negative feedback loops and of advantages of synergy and scale. It argues that a big-push dimension that produces national and regional case studies can increase the field's proactivity.

1. Deconstructing or re-inventing or both – What to do with the big push in the current debate?

Agricultural development studies finds itself caught in some of the most elusive contradictions of economic thinking in this early 21st century. The discrepancy between emphatic demands to vastly restructure agricultural systems in both developing and developed countries in order to meet widely recognized, fundamental goals such as food security, resilience to climate change, livelihoods for one-third of humanity, carbon sequestration, and the lack of conviction to invest the necessary sums and efforts in reconstructive processes make a particularly puzzling combination. In the next decades, however, the multiple crises of conventional agroecosystems will attach renewed immediacy to the question of their development, and new *critical junctures* for institutional change can be expected, with different 'solutions' bidding for public funds and recognition (Acemoglu & Robinson, 2012). In this context, agroecology positions itself with the call for a 'new agrarian revolution' through sustainable intensification and social justice (Altieri et al, 2011). But while its strategies on the farm- and village-scale are already well-defined and presentable, a theory and term (catchword) to describe the required effort on a national level has not yet emerged.

This article argues that we need to re-invent, within the agroecology paradigm, the mental image of the *big push*, the concerted effort to break through negative feedback loops that was so present in early post-colonial development strategies. Unquestionably the big push was in the past primarily an appendix to *green revolution* and/or state capitalist development strategies, and has lost credibility together with them. Nonetheless, scholars and policy-makers should not read the previous attempts to materialize a *big push* as a failure *in theory*, but rather as the implementation of a correct imperative under incorrect parameter assumptions, such as the focus on inputs, centralized knowledge creation & dissemination and the progressive integration of peasants into spheres of market or state influence. Agroecology provides an alternative to the perceived linearity towards the commodification and industrialization of agricultures – the object of the first life of the big push. Since the parameter assumptions that frustrated the big push in its earlier incarnations have been exposed and replacements found and consolidated, the question of whether agroecology should, given the immediate necessity to transform agroecosystems on a large scale, formulate a revised framework for a big push in the transition to sustainable agricultures on a national scale needs to be addressed. New political economy research on the contradictions of partial, cooptable efforts such as organic labelling, fair trade regimes and conservation-by-fencing should also renew our interest in the conceptualization of feedback loops.

The article draws a short history of big-push theory, focusing on the parameter assumptions of previous implementations. It then examines the chances for a large influx of funds and efforts into agricultural development (from here: AD) in the coming decades, and argues that agroecology should 'place a tender offer' for these funds by actively and pre-emptively developing proposals for large-scale guided agrarian change programs. Finally it collects the main parameters of a big push for agrarian change through agroecology, and submits them for discussion.

2. The first life of *big push* theory and the development of agricultures in the 20st century

The core of big-push theory is the observation that economies with low capital stocks (physical, social, human and/or environmental capital) are subject to an array of feedback-loops between their various 'dimensions of poverty'. The interplay of these keeps them in a state of quasi-equilibrium at a low level of productivity, forcing in turn a low rate of savings and investment. In economic terms, these 'poverty traps' are characterized as inhibitions to increase the rate of investment out of the total of economic activity, be it to build the fertility of soils, use time and energies to experiment and learn, construct factories for equipment, lay out infrastructure or fund veterinary faculties (Rosenstein-Rodan, 1943; Nelson, 1956). In his 1962 article *The big push in Indian agriculture*, S.N. Ghosal writes: "The starting point of all plans of economic development of an underdeveloped country is to break through the vicious circle at the point of low capital formation" (1962: 227).

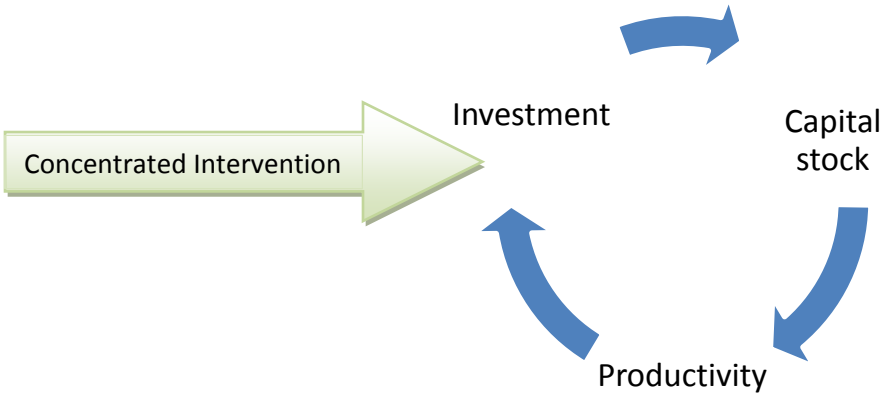

Figure 1: The central goal of big push strategies is the artificial increase of the investment rate

This basic logic also underlies conceptualizations of agrarian change through agroecology. The concept of resilience, especially, describes the quality of physical, ecological, human and social capital within an agroecosystem in light of its ability to withstand shocks (Holling, 1973). It calls for the formation of such capital in order to build local and national sovereignty against environmental degradation and catastrophe as well as economic exploitation. "Poverty" is thus defined in socioeconomic *and environmental* terms, i.e. poor are the subjects of agroecosystems characterized by high volatility, low yields relative to local needs, and/or high levels of inter-human exploitation. In such agroecosystems, ecological as well as social and economic feedback loops are likely to limit the potential gains of small scale projects. In agroecology, the conceptualization of the *agroecosystem* as including not only local 'fields and farmers' but also regional to international policies, markets and climates, contains this perspective, and agroecologists' research has often followed a political economy/ecology approach to the study of land management. Although the term itself is not commonly used, every time research finds that a problem manifests itself locally and is enacted by local actors, however decides that a purely local solution is unlikely to exist (i.e. the problem has roots in regional, national or international policies, markets, social systems or climates), she/he is uncovering feedback loops that hinder or limit local change in the absence of changes in super-local structures. The body of research that

in this way implicitly recommends big push strategies has grown quickly in the last decades; nonetheless the field stopped to produce and debate such strategies.

A development theory becomes a big push theory when it a) recognizes the (partial) 'trap' character of poverty, and b) argues that in order to leave a 'poverty trap', several negative feedback-loops need to be addressed in conjuncture via the coordination of many small investments on different layers. Some big-push economists used the metaphor of the 'take-off' of a plane: "Launching a country into self-sustaining growth is a little like getting an airplane off the ground. There is a critical ground speed which must be passed before the craft can become airborne..." (Rosenstein-Rodan, 1957). Here also originates the term of the 'take-off' phase in economic development (see Rostow, 1960), a concept coherent with other popular development theories at the time, such as Nelson's theory of the "low-level equilibrium trap" and Leibenstein's concept of the "critical minimum effort" (Nelson, 1956 & 1960; Leibenstein, 1957; Oshima, 1959). Each recommended a drastic increase of the investment rate as the central goal of development policy: "Unless induced investment reaches a certain point […] an underdeveloped economy has a tendency to slip back to the hard ring of poverty" (Ghosal, 1962: 228). The necessary resources could be derived either from an outside source (development assistance, payment for export goods) or from development enthusiasm in the interior (due to independence, revolution or existential fear of failure (as in the cases of Israel and South Korea)).[1]

Although the first works in big-push theory foresaw that 'backward' small family farms would disintegrate entirely in the process of modernization, and understood the world's rural areas merely as a) the source of "unlimited supplies of labor" for urban industrialization and b) the site of large-scale plantations to feed the cities, generate capital and export revenue (Lewis, 1954), a revision in the 1960s established that also smallholders could develop an entrepreneurial spirit ('the smallholder capitalist', see Schultz, 1964; remains in place in World Bank, 2008) and may under certain conditions be granted the rights to exist within the divine process of modernization (Cullather, 2004). The development of agriculture, however, remained an appendage to industrial development. When contradictions between them arose (as in the case of dam construction) theories would favor the latter.

As political movements throughout the developing world nurtured on the vision of swift economic growth and development, the notion of the big push left the economics departments and developed an extensive *Eigenleben* as a development 'mentality'. Many of these movements, however, failed to yield the expected results, developed autocratic features or lost ideological and military struggles. As a result, varieties of development pessimism flourished. Since the 1990s, mentioning the agrarian big push is typically seen as a symbol for good intention, but ultimately naivety, unworldliness or nostalgia.

Although a meaningful analysis of the reasons for the failure of past *big pushes* is not within the boundaries of this work, two simple observations suffice to acquit the big push from its current position of discredit. 1.: Not all big pushes in the 20th century failed – agricultures in post-war Europe, Japan, Taiwan, South Korea, Vietnam and Israel, amongst other countries, experienced sustained growth as a response to big-push policies (Spoor, 2012; Oh, 1998; Schmidt, 1955; Yager, 1988). 2.: When big pushes failed or produced new inequalities, the reason was not their scale and optimistic outlook, but the specific parameters used. Too often, the big push was to be realized single-handedly via the "distribution of superior varieties of seeds on a wide scale and more extensive use of fertilizers" (Ghosal, 1962: 226), encouragement of rural capitalism, differentiation and either market-led land reform or collectivization.

[1] Of course these ideas were not invented in the 1950s, but draw heavily on the experience of cooperative-led agrarian development in Western Europe from the 1850s on and the early Soviet agrarian debates. The Marxist agrarianism of Bukharin or Kautsky certainly implied big push strategies to overcome the feedback loops of capitalism and rural underdevelopment, while Chayanov's agrarian populism followed the "Raiffeisen model" of cooperative development. "Revolution" in the Luxemburgian sense is of course nothing other than a (very) big push.

Table 1: The *Green Revolution* strategy for a big push for AD: Perceived feedback loops and paths taken to address them

Feedback-loops perceived	*Intervention strategies*
Low surplus yields for capital formation	Input distribution (seeds, fertilizers, chemical biocides) Large-scale irrigation projects in marginalized areas
Uncultivated land remaining	Mechanization to increase the worker-land ratio Large private or state farms or ranches
Underused labor resources in rural areas	Different varieties of land reform; collectivization; labouring on plantations/state farms
Backward agronomic knowledge of peasants	Centralized research; dissemination through hierarchical extension (*instruction*) services; Land concentration in the hands of the trained
Productivity increases lead to price decay	Agricultural subsidies; price politics; state procurement

To agroecologists, the main parameters of the 'first life' of the big push (land concentration, input-based productivity gains, top-down extension and the willingness to replace all 'traditional' by 'modern' knowledge) are hopelessly outdated. In addition, parameters were often set to cater to vested interests outside the agrarian society they proclaimed to benefit, or to particular actors and groups within existing agrarian class structures (see Bharadwaj (1985) for the Indian case). Priorities among the various stocks of capital (human, social, genetic, savings, machinery, buildings, irrigation works, soil & biomass) were distributed in ways that agroecologists question – the neglect of human, social, biomass and especially soil capital is now judged as catastrophic.

Consequently, the big push can be 'updated' by replacing strategies that have proven unsuccessful in previous incarnations by others, thereby re-inventing it for a new purpose. The scope of action remains the same, as well as the optimism to reach broad development goals within a short timeframe. From a theoretical point of view, the agrarian big push could be re-animated for a 'second life' in the 21st century.

In the 2000s, the big push has indeed been re-discovered by scholars like Jeffrey Sachs and Paul Collier, and implemented through the United Nations Millennium Project (Sachs & McArthur, 2005; Binagwaho & Sachs, 2005). Nonetheless, AD efforts within such fast-track projects remained focused on input distribution and external "training" of local farmers (Sanchez et al, 2007), and should largely be understood as re-incarnations of the 'first life' of the big push (see also the critique by Wilson (2013)).

3. The need for a large-scale transition to sustainable agriculture in the 21st century

3.1 Yield targets for the 21st century

Targets for sustainable yields will remain the starting-point of public discussion about AD for the foreseeable future. Although farming systems in industrialized countries are able to feed 100 and more people per full-time farm worker, this does not represent a target for developing countries. Higher yields-per-labor and the implied increase in farm size would result in the displacement of a large part of the rural population without a corresponding sustained labor demand in other sectors. Likewise, reaching yields-per-hectare equivalent to those reached in industrial, high-throughput agricultures is not necessary: if Western European yields were generalized on all global agricultural land, world net production would more than double, sufficing for 15-25 billion people[2]. The crucial part of the closing of the global yield gap is therefore its first half (on the

[2] Using FAOStat data (FAO, 2013); similar potentials are indicated by Badgley, 2007; Pretty, 2008; Pretty et al, 2011.

agroecosystem level), which agroecology can realize on existing small farms and with relatively low investment needs (de Schutter, 2010; Altieri, 1989; Gliessman & Rosemeyer, 2009).
Agroecology re-frames the general question of agricultural productivity, which always had been 'how to increase the yield-per-*labor*', into 'how to increase the yield-per-*area* while maintaining the livelihoods-per-area'. On the other side of the coin, the general question of rural wealth generation asks for (re-)valorization of agricultural goods, diversification and (in some areas) yield increases, instead of the increase of area-per-worker fostered or implied by competing paradigms.

3.2 Chances for a large influx of resources into AD until 2040

A national big push has to be fuelled by resources, attention and political assistance by the national government and international actors. The depression of interest for agrarian change in the last decades has been widely debated, and at this point it may seem naïve to discuss the parameters of a new big push in the 21st century, given that its primary requirement is so obviously obstructed.

Many signs, however, indicate a probability that this circumstance will change in the next decades, and that we should expect a large influx of resources and attention into AD until 2040 at least in some countries. Although practitioners would certainly prefer to see AD rise on the agenda via a new era of concerns for ethical truth, poverty reduction, basic rights and sustainability, these discourses may remain weak determinants of political action on the national scale. Political and economic power will most probably continue to endow organizational structures with no intention to re-evaluate the deeper philosophical premises of agriculture. The recent history of international goal-setting and -missing (MDG, Kyoto, Convention on biodiversity) reminds us of this reality, as does the apparent 'normality' of the hunger crisis (Lang, 2010).

Nonetheless, a search from within the current ideological setup discovers other perhaps more realistic pathways that may produce a new influx of resources into agrarian change and open the tender bid for a new big push. In the following, some reasons why ruling elites may develop new interest for AD in the coming decades without making a leap of ethical consciousness are compiled[3]. These are of course highly interdependent, and political will could be created through their joint stimulation rather than by way of one single cause.

a) Recognition that **vegetative and soil carbon sequestration** is as of today the only potent strategy to sequester greenhouse gases from the atmosphere on a significant scale (Vuuren et al, 2013). Studies by Lal (2004a) and Brown et al (2010) have found that land-use changes have contributed up to 60% to the total anthropogenic increase in GHG content in the atmosphere, while fossil fuel combustion contributed as little as 40%. This increase was found to originate to 35% in the loss of vegetation and to 65% in the loss of carbon from the soil through soil erosion and degradation (Lal, 2004b). As sustainable practices could allow plants and soils to re-fixate the lost carbon directly from the atmosphere, carbon loss from land-use change is the only anthropogenic emissions process that is almost completely reversible on a human time-scale. Of the 4 Gt of CO_2 annually accumulating in the atmosphere, at least half could be sequestered through agroecosystem change (Albrecht & Kandji 2003; Lal, 2004b; Metz et al, 2007; Kumar, 2011; Stavi & Lal, 2012).

b) In case of a last-moment scramble to **reduce greenhouse gas emissions**: the food system today causes around 33% of global emissions (Foley et al, 2011). A majority of these are from processes that

[3] Tony Weis chooses a similar interpretation of the "accelerating biophysical contradictions" of industrial agriculture as possible "openings for rebuilding biodiverse food systems and remaking and valorizing agricultural work" (Weis, 2010: 315).

research has found to be transformable into low-emission processes (aerobisation of rice production, decrease or abolition of tillage, appropriate use of manure, decrease of fertilizer use, residue mulching, market localisation etc.). Agriculture has a mitigation potential of at least 50% of its current emissions at constant yields (Smith, 2012). In the business-as-usual scenario, however, emissions from agriculture are expected to rise (Bruinsma, 2003).

Although as such this is mainly an ethical point, it will in part come into effect in terms of discursive and economic pressures originating from carbon markets, country marketing and branding concerns, or even carbon treaty obligations. These pressures may be used to advance neoliberal projects for nature commodification (as argued by Fairhead & Leach, 2012), but can also be converted into alternative projects on the national scale. The possible responses are, in principle, many: Ecuador, for example, offered non-exploitation of an Amazonian oil field in return for a 50% compensation that could be deducted on carbon markets or donor-marketing for rich countries. The Cuban government conciously brands the country in relation with these pressures, both to the outside (tourists, investors, donors) as well as to its own demos, with one effect being the continuation and strengthening of agroecology-inspired policies that were initially developed as medium-term programmes to manage the economic crisis of the 1990s. What these cases show is that, even though globalized capitalism will develop economic and discursive forces in order to capitalize on climate change, national governments have significant leeway when transforming them into national policy. Growing discontent with the poor sustainability performance of global agricultures, in turn, may make an already tangible proposal for a big push interesting to the marketing section of national government, especially with regards to 'being the pioneer' (providing political legitimacy, promoting the country internationally, etc).

c) Recognition that agricultures need increasingly to be judged by their *resilience* to **unstable weather patterns and extreme weather events** (Holt-Giménez, 2002, Godfray et al, 2011). Governments in tropical, subtropical and semi-arid regions will increasingly be confronted with projections that both traditional and industrial agroecosystems in their countries will lose up to 50% of their yield potentials (NRC, 2011). In this context, also the FAO is moving the first steps in the direction of agroecology in its proposals for 'climate-smart agriculture'. Since the 'Four degrees and beyond'-conference at Oxford University in 2009, climate scientists have increasingly called the current objective of preventing a rise of average temperature by more than two degrees relative to pre-industrial levels very unlikely to be met. Although already a two-degree rise would signify an enormous increase in unpredictable and extreme weather events, the likeliness of an average increase of three degrees or more will make the transition from super-exposed to resilient agroecosystems interesting for the powerful discourses around key concepts like national security, political stability and food security.

d) Rapidly growing **biocide resistance** in pest populations has the potential to significantly threaten the industrial mode of production in many crops by increasing the costs to producers and states (Alstad & Andow, 1995; Whalon et al, 2008; Lu, 2010).

e) **Biophysical decay:** Increases to the difficulty to provide water for high-throughput systems, as well as oil for traction and phosphate for fertilizers (Foley et al, 2011; Gleick, 1998). At the same time, many soils continue to be exploited practically through a mining system. As Tony Weis argues, however, these "accelerating biophysical contradictions of industrial capitalist agriculture […] might also widen openings for rebuilding biodiverse food systems and remaking and valorizing agricultural work" (2010: 1).

f) Irrefutable evidence for large additional costs *to the state budget* associated with **agricultural externalities** may become an argument in national discourses (Pretty et al, 2001). In a recent study by Jules Pretty et al, agricultural externalities and food transport costs in the UK were found to outweigh farm income by at least a factor of 3 (Pretty et al, 2000; Pretty et al, 2005), backing doubts about whether 'organic' agricultural production would produce more expensive food if implemented systemically. The growing degeneration of ecological assets steadily increase the subsidy needs and insurance costs for conventional monocultures, making alternative approaches interesting within the state budget discourse. First evidence has been the adoption of Integrated Pest Management (IPM) and conservation agriculture by agriculture ministries throughout the world (Pretty et al, 2005; Kassam et al, 2009) as a step 1-initiative of the conversion process to sustainable agriculture (in the sense of Gliessman & Rosemeyer, 2009: 6-8).

g) **Greater autonomy of some developing country governments** (in Latin America, Asia, but also Africa), who may at least in some cases see economic and political benefits in the implementation of larger-scale AD projects. These governments can, as is tentatively shown in the Ecuadorian case, develop the political-ideological foundations for a commitment to agrarian change (Acosta & Martínez, 2009).

h) The ongoing **crisis situation in nutrition** may develop into a critical junction in some countries. In its current Human Development Report, UNDP predicts 3 billion people in extreme poverty by 2050 (UNDP, 2013). **Food price volatility**, which increased drastically over the last decade, may also be a ready argument for some national governments and political movements to re-value national, resilience-based food production.

i) Desperate efforts for **conservation** and ecological asset conservation have to pass through agrarian change – as sustainable intensification in domesticated areas to reduce the stress on natural areas, and as partnerships with farmers for ecosystem service delivery (Chappel & LaValle, 2011; Fischer et al, 2008). Conservationists increasingly tend to call for land and ecosystem conservation efforts by way of sustainable use rather than fencing-off (Perfecto & Vandermeer, 2010; Perfecto et al, 2009).

j) **Peasant politicization**: Within the next decades, millions of farmers every year will become aware of the drastic changes that are occurring in the foundation of their livelihoods, driven by new access to information, exchange through farmer networks like Via Campesina and its members, and an increasing confrontation with deeply upsetting events like changed weather patterns and extreme price instability. As the implications for the individual farmer's life are existential, and since millions will come to fear them at about the same time, the endemic drive for change originating in the main class of stakeholders should be expected to grow exponentially in the coming decades, while Marx's assumption that peasants are by geography un-organisable crumbles further. Evidence suggests that this process of conscientization has accelerated in the new millennium (Martínez-Torres, & Rosset, 2010; Wittman, 2009; Rosset, 2011; Kerkvliet, 2009). The evolution of organization and networking in peasant unions, together with scientific and advocacy efforts in their support have realistic chances of developing with the same rapidity as the workers movement in periods of nourishing circumstances during the 19th and early 20th centuries. The resulting change in power relations can be powerful enough to alter the decision-making process of national governments, as the Zimbabwean establishment proved when it accepted and legalised the 2000-2002 bottom-up land reform (Scoones et al, 2010).

k) **Counter-migration**: Any effort to slow down outmigration from the rural areas of developing countries would need to centre on agrarian change at the source. Efforts may come from city-biased governments that want to restrict the construction of new slums that cannot be provided for, or by rich-country governments trying to go to the source of new international migration crises (Böhning &

Schloeter-Paredes, 1994; Morrissey, 2009; Castles, 2002; Boano et al, 2008). In some countries, emerging capitalism's appreciation of a labor reserve army of rural refugees may be outweighed by the very size of the already existing reserve (with increasing unemployment in many developing cities), lower labor needs in technology-intensive industries and services, and the increasing costs of subsidized food, re-training, and coping with slums. The 'Planet of Slums' is by no means inevitable, and some governments may follow the traces to small farming as the only sector capable of retaining or even re-absorbing those people capitalism declares surplus (Peters, 2013).

l) The realization that in many settings, sustainable intensification of agriculture and strong rural communities are an important strategy to reach a **stable peace**, especially in highly populated rural-based countries such as Rwanda (Addison, 2005), Eastern Sudan and in India's 'Red Corridor'.

m) Growing **disbelief in proposed alternative solutions**, including genetic engineering, large-scale vertical or hydroponic agriculture, agrofuels, geo-engineering, fusion energy, but also the supposition of consumer action and diet-shifting. Genetically engineered crops, for example, can only trigger so many *increases* in pesticide need until their use will be discontinued (Lu, 2010; Wang et al, 2008; Lal & Pimentel, 2009; Gliessman, 2013).

n) The best insurance against **land grabs** are land improvement efforts that make it impossible for state actors to characterize the respective lands as 'idle', 'unproductive' or 'under-utilized' through whatever lens used: productivity, sustainability, but also aesthetics ("Does the land correspond to ideal pictures of 'productive landscapes'"). After the initial flood of sensationalist stories about corruption, it is now clear that the phenomenon of large-scale land acquisitions is much deeper rooted. When state actors decide to allow and/or assist land grabs in their territory, they do so in consideration of state revenue and balance of payments crises, within which low-productivity subsistence agriculture has less weight than even the possibility of taxing an agricultural company and seeing its products exported or going to national markets. The next 'surprise' was to find that peasant communities in and around the proposed investment sites weigh the investing company's proposal for farm labourer livelihoods against their current livelihoods as marginal farmers – and often decide in favour of the former, however grudgingly (Borras et al, 2011). In both decision-making processes (by state actors, and by local communities), defensive strategies of resistance alone often fail to halt the loss of control over land. An offensive strategy is needed alongside them, which means presenting an alternative project of 'progress in the countryside' that improves existing livelihoods through sustainable intensification. Only by presenting a country-wide alternative project for AD can the state be pushed to halt and reverse land grabs in its territory. The resistance of local communities, as well, needs alternative visions of endogenous investment in the land to rigorously decline control-for-investment offers by national or international companies.

o) Finally, **advances in the agronomic sciences** in themselves, as far as they have an influence on policy-makers, point towards a re-orientation of mainstream AD policy. The academic discourse has shifted profoundly, from a focus on the single farm, the single entrepreneur and the single crop towards a focus on complex interdependent systems, on cooperatives, on the guidance of national and international markets. To reach sustainable systems and overcome negative loops, academics more often propose solutions with a large scale- and medium- to large time-component. Articles and reports that in the 1970s advised scale-indifferent, short-term solutions like input-provision, machinery sales and centrally-developed instructions on farm operation have gradually shifted to topics like farmer organization, capacitation and the provision of resources to develop endemic solutions to problems that are increasingly understood as complex and highly specific in space (see Scoones (2009) on the recent 'coup' by the academics invited by the World Bank to write the

International Assessment of Agricultural Knowledge Science and Technology for Development (IAASTD)).

It is not unreasonable to prepare for an increasing interest in agrarian change and in the question of how sustainable agriculture can be scaled up to meet goals on the national level. If the tender offer for a big push is opened, even if only in a limited number of pioneering countries, agroecology should place its own bid.

For progressive political movements preparing to enter government, a big-push strategy continues to be a good option to secure re-election within a polemicized arena. It has the advantage that the rural demos can see direct and substantial results; with dispersed AD tactics this may not be the case, especially concerning the visibility of government intervention. The direct and substantial rise of living standards during the Cuban big push of the 1960s and 1970s, for example, has been one of the strongest arguments for the continuity of wide popular support for the political movement that instituted them. Since 2002, Venezuela's government has used big-push strategies in public service provision to win continued support of the urban poor, the country's largest electorate. In a rural economy, conversely, a well-devised agricultural big push is an enormous argument for re-election.

3.3 The new feedback-loops

The negative feedback-loops and poverty traps that must be overcome by an agroecological big push in 2020 or 2030 scarcely resemble those that were perceived, and attacked, in the 1960s and 1970s. Nonetheless the last decades of research have compiled a solid knowledge-base about the different economic traps associated with traditional subsistence-farming, input-dependent, one-dimensional green revolution agriculture, as well as organic input-substitution schemes. Today's developing agricultures are, on the national-economic layer, caught in different varieties of a general negative feedback loop, each consisting of a unique combination of a set of loop-inducing factors (Figure 2).

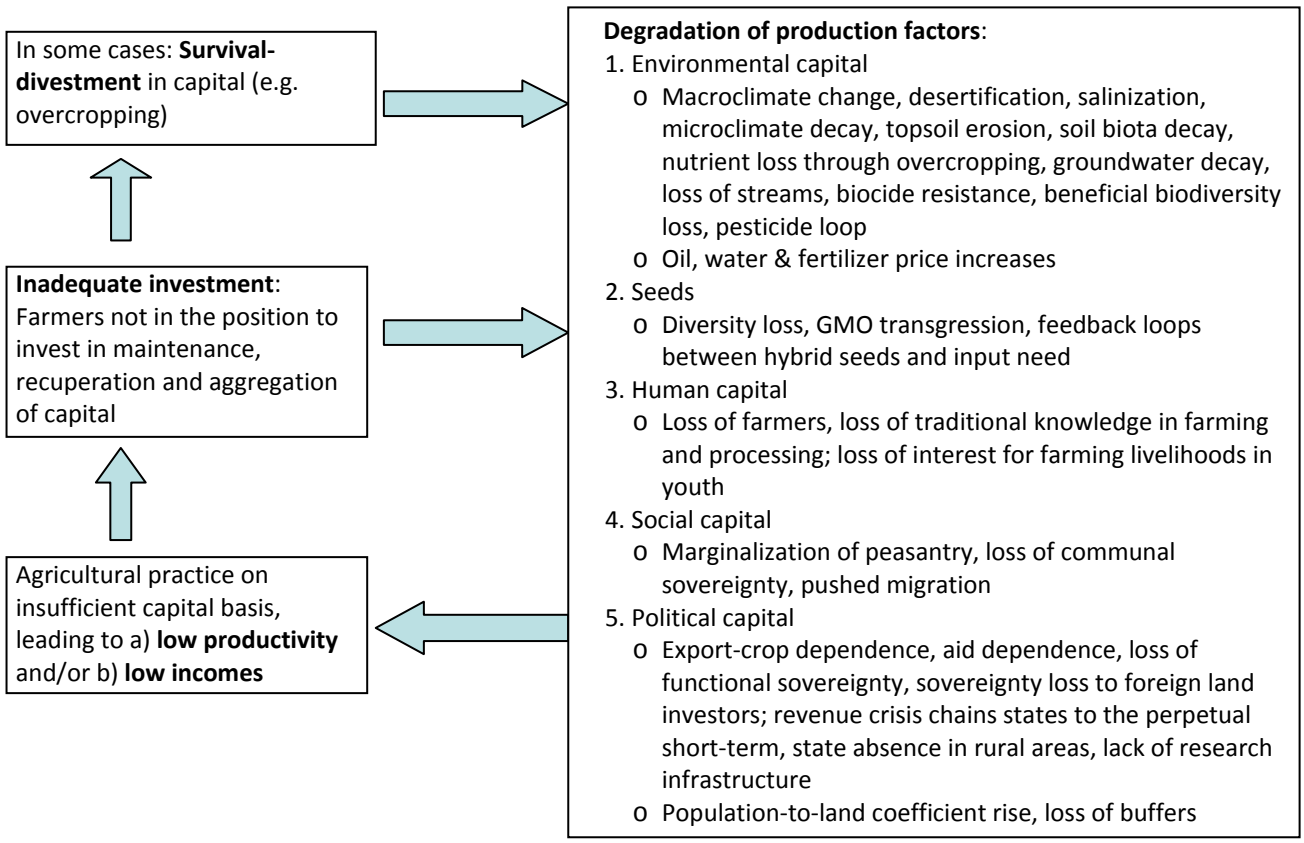

Figure 2: Nation-scaled low-sustainability feedback-loop impeding the development of sustainable agricultures in developing countries in the absence of an agroecological big push

In addition to the various impediments to 'automatic development' via endemic investment cycles, we have to concern ourselves with 'secondary traps', which arise in the moment we try to positively disturb an equilibrium by instituting development programs, whether they come from within the community and/or from an outside organization. Well-explored secondary traps and feedback loops are:

a) Local elites often perceive higher benefits in unsustainable, exclusive models of development, and will use their power to move development projects into that direction. The only alternative to expensive compromise and sabotage is the development of a balancing political power in the peasantry (Vergara-Camus, 2012; Wolford, 2010; Wittman, 2009).

b) Farmers' scientific illiteracy has been found to impede more complex solutions, however only if these are based on 'outside knowledge', that is, laboratory solutions that farmers are expected to implement without understanding them (Tschakert, 2007). Farmers' conservatism and mistrust in such situations has been documented (Cummins & Coventry, 2011), especially when economic leeway for experimentstion or transition costs is limited.

The current picture of poverty traps will be valid only until climate change and population pressure release new waves of survival-divestment, and until important capital stocks (soil, biodiversity, traditional knowledge) are further diminished to a degree that completely new recuperation techniques must be developed. When factoring-in secondary traps that can impede or divert development efforts, extended action under a big-push mentality is needed to accomplish the transition to sustainable and equitable agricultures in due time.

3.4 Imagining the big push, and the psychology of social movements

Until here, the argument has been that the big push did not leave us in the 1970s, but that it was waiting for a general overhaul while being parked by the forces corresponding of neoliberal globalization. For multiple, interlinked reasons, a new opening for big push mentality may develop. Agroecology can, by devising its own big push strategies, take a stand in the debate on the parameters of that next wave – What kinds of big push are possible, and how they could be unfolded. This necessitates not only the critique of conventional strategies, but also pro-activity in proposing alternatives of the same scale.

A second argument for pro-active, i.e. pre-emptive, proposals is found in social movement studies. Whether potential participants of agrarian movements, unions, parties, community organizations and other change-oriented groups join or remain passive outside of them, invest time and effort or remain passive inside of them, and whether they face or flee repression depends on a number of pull- and push-forces. Of those forces that the movement itself can control (excluding, for example, media stigmatization), one of the most potent is the perceived *cause* of the movement. The 'institution' of the cause spurs members and sympathizers to imagine possibilities that the movement's success could bring. In the 20th century, the individual and collective exercise of imagining the communist society has contributing enormously to mobilization and sympathy for the respective movements[4].

For emerging agrarian movements and their supporters to develop proposals for an agroecological big push in their territory could have a number of effects on the radiance of their shared cause. It would

[4] I do not mean to make a statement on the relative weight of this factor against factors such as short-term gains, social and class antagonisms and so forth. Instead I believe that a successful movement has convincing arguments on all time-layers, from the short-term, practical wage increase or abolition of land rents to social group dynamics and culture, all the way to a (cosmo-)vision of the future-to-construct.

a) integrate the existing partial causes (e.g. resistance against specific projects or processes, advocacy for specific laws), thereby discussing how this integration is feasible.
b) If well calculated and articulated, big push strategies proposed by or in collaboration with academics give credibility to the cause (by doing feasibility calculations and extrapolating gains from pioneer cases onto the national scale etc.)[5]
c) By doing a) and b), they increase the perceived potential of pioneer projects or educational efforts, making them more valuable activities to engage in.
d) These efforts are likewise aided by the fact that already existing but very abstract, word-based abstract causes are developed into clearer, more tangible picture-based 'visions-in-color'. For most participants/members/sympathizers a lower abstractness of long-term visions fosters not only their apprehension, but also the ability to discuss, critique and thereby scale these visions out into their specific contexts. The collective educational process that is one pillar of every agrarian movement could be crucially vitalized by big push proposals. By moving the debate over a movement's long-term vision or greater cause from abstract concepts ('sustainable agroecosystems'; 'equality'; 'human rights' etc.) to actual landscapes, its 'imaginability' increases, encouraging the debate over it to include not only intellectual and political circles, but virtually everyone who *sees* and has intimate knowledge of the respective landscape. The 'cause' becomes concrete: formable and debatable with techniques such as drawings on paper or on soil/sand, and using local terms, crops, polycultures, currencies and other calculations of value, extrapolated on local geographies.

All inhabitants could thus participate in the open development of big push strategies in their landscapes, while communicating with larger-scaled imaginations about the necessary and feasible changes to trade patterns and state programs. Nonetheless, many will need an initial, pioneering plan on which to react by specifying, critiquing or changing objects or patterns based on their contextual knowledge and preferences. Academic supporters of agrarian movements could understand the drawing of such crude, flexible plans (i.e. the initial 'act of chuzpah') as one of their contributions. As shown above, this would not have to entail a bias for centralized, state-controlled 'big push programs', but the provision of flexible 'stencils' designed to be scaled-out to local circumstances.

4. The vision of agrarian change in the Agroecology paradigm

4.1 The paradigm shift from 'modern' agriculture to agroecology

Agroecology evolved as a string of responses to the experience gained from worldwide AD efforts under the green revolution/agricultural industrialization paradigm. What began as the discussion of various limitations faced by the nascent green revolution in the 1960s and 1970s became the try to integrate the many solutions that had been found into a new, competing paradigm in research and practice (Altieri, 1989; Gliessman, 2011). From the 1980s onwards, studies under the agroecology paradigm have multiplied rapidly, new topics were covered and pioneer projects solved many limitations. In the new millennium, the quest of how to scale them up has shaped the spirit of agroecologists more than any other (Altieri et al, 2012).

Limitations in conventional AD have been widely debated in agronomy and AD studies (IAASTD 2009, de Schutter 2010)[6]. Research in agroecology has thus largely been framed as responses to the negative feedback

[5] Examples of this effect are the studies by Eric Holt-Giménez (2002) on the resilience of agroecological pilot farms in Central America, and Jules Pretty (2006) on the yield gains and input need decrease in agroecological pioneer projects. Both gave an important argument to agrarian movements by convincingly underlining claims that 'agroecology can feed the world'.

[6] In many ways, 'modernized' agriculture has been humbled: even the mainstream no longer sees it as a 'good solution in itself', but merely as the 'only possible solution' in the perceived absence of alternatives.

loops and 'poverty traps' described in Figure 2[7]:

1) Biological and climatic vulnerability of industrial and green revolution systems;
2) Long-term unsustainability of input-dependency (input availability (water, oil, phosphate), loss of biodiversity pools and emissions leading to climate change);
3) Social costs of input dependency, loss of sovereignty on the family and community level;
4) Access inequality (to inputs, to far-away markets, to decision-making);
5) Price volatility, high post-harvest costs (transport, storage, retail) & undemocratic properties of large-scale food systems;
6) Dependency on food imports & export crops, state revenue crises;
7) Low productivity in marginal(ised) agroecosystems and some traditional systems;
8) Loss of peasant livelihoods, displacement and loss of traditional knowledge, rural decay, rural-urban push migration;
9) High process cost barriers to green revolution and organic AD (Capital, infrastructure, inputs).

Agroecology views agricultures through the perspective of *agroecosystems*, which have ecological, agronomic and social components and spaces. It propounds a peasant-based agriculture, based on the operation of small- and medium-sized family farms. This follows the observation that smaller farms are managed more intensively and generate more value per area than larger-scale operations (Rosset, 2000), and that long-term identification with the land, with certain agroecosystems, practices and food cultures are powerful determinants of a work ethos that unites concerns for sustainability and productivity (Netting, 1993).

4.2 Agroecological strategies for rural development on the village-scale

In village-scale AD projects, agroecological solutions have taken on many forms depending on climate, existent capital, the particular forms of traditional knowledge and culture present and resources available for the project (Altieri & Toledo, 2011: 595). The general direction of agroecological system design – low external input use, integration & diversification, nutrient cycling, auto-innovation and the balancing of political, social and economic powers within the agroecosystem – branches out into specific, place-dependent solutions that have to be searched on the spot by the largest-possible part of affected populations (Altieri et al, 2012; Gliessman & Rosemeyer, 2009).

Table 2: Frequent directions of agroecological development on the village- or district-level

Agronomic strategies: Revitalization of existing small and medium farms: (Altieri et al, 2012; Altieri & Toledo, 2011; Altieri, 1989; Gliessman & Rosemeyer, 2009; Ewel, 1999)
- Agroecosystem diversification: polycultures, seed diversification, livestock integration, agroforestry
- Reduction of input use & reduction of human labor needs (weeding, tillage, nutrient transport)
- Nutrient cycling: cover-crops, mulch/green manure, livestock manure, composting, agroforestry, biochar
- Developing agroecosystem resilience to extreme weather events or the sudden scarcity of a productive resource (see Machin-Sosa et al, 2010; Holt-Giménez, 2002;)
- Water harvesting via contour farming, swales, terracing
- Appropriate technologies in farming, processing, storage

[7] My use of the concept ‚poverty' should be seen in light of decolonial critiques. The conventional conceptualization is shattered by these critiques, but for many it re-emerges as a, qualitative endemic measure. In farming areas, this decolonialized *poverty* often refers to ecological capital and social autonomy above material possessions.

- Recuperation and protection of supporting ecosystems

Social and economic strategies: Agrarian citizenship and the association of free individuals:

- Revalorisation of peasant work, knowledge, intuition & culture (Wilson, 2010; Wittman, 2009)
- Cooperative organization for processing and marketing
- Diversification of incomes and locally-sourced diets (Bachmann et al, 2009)
- Localizing innovation by supporting farmer-experiments and their horizontal dissemination
- Local and regional breeding, seed production and exchanges (Ríos, 2009; Ortíz et al 2009; Moreno et al, 2009)
- Cooperation in farmwork: Planned grazing of combined herds (particularly in steppes), irrigation works, machinery pools
- Building social capital and services for a healthy community

Efforts under the agroecology paradigm tend to be informed by an agrarianist understanding of development sociology. Farmers are assumed to respond best to development projects when they a) are farmer-led and horizontal, b) focus on agroecosystem resilience and economic resilience, c) show at least one drastic improvement to the farm within one to three years and d) encourage the farmers themselves to carefully scale out the applied concepts to their specific setting (Bunch & Scarborough, 1998; Holt-Giménez, 2006). Unlike in top-down extension, the complexity of proposed solutions is not a limiting factor, given that they are understandable within the particular kinds of intuition developed throughout peasant lives. Advancement must be expressed within existing structures of thought, experience and tradition, although it may certainly aim to enrich them. In many cases, it is appropriate to leave AD up to the community itself, while supplying opportunities, ideas, exchange opportunities and a just playing field.

5. Agroecology on a national scale: Potentials, strategies, investment needs

Many dimensions of an agroecological strategy for big-push development in the 21st century must be explored, a task that goes far beyond the scope of this article. As on the village-level, these will have to be scaled-out to suit individual cases. Conveniently, however, the number of cases is reduced to around 300 cases, i.e. the number of countries and major regions in larger countries, allowing academic debate to take place about each. Table 3 collects the general directions along which these case studies could begin inquiry on the way to presenting proposals.

Table 3: Agroecology and its probable competitors in tender offers for a big push for sustainable agriculture in the 21st century

Inadequacy of current agroecosystems (as in 4.1)	*Agroecological solution*	*Probable alternative bidders*
Biological and climatic vulnerability of industrial and green revolution systems	Functional biodiversity; Interdependence; Nutrient cycling	High-Technological innovation (genetic engineering, centralized smart systems, satellite precision farming); Concentrate production in highly-capitalized 'breadbaskets'; Global integration of systems via 'smart markets' & trade
Long-term unsustainability of input-dependency (input	Full-cost analysis; Alternatives to external inputs;	Centralized smart systems; Carbon markets;

availability (water, oil, phosphate), loss of biodiversity pools, and emissions leading to climate change)	Water harvesting; Agrobiodiversity; Mosaic landscapes; Emission reduction; Livestock numbers reduction	Macro-geoengineering (canals, rain control etc.); Biomass energy; Devil-may-care attitude or denial
Social costs of input dependency, loss of autonomy on the family and community level	Supersede input needs via nutrient-cycling; Valorisation of peasants; Producer organizations; Peasant rights; Food sovereignty; Localization	Food aid; Land concentration; Exit from agriculture incentives
Access inequality (to inputs, to far-away markets, to decision-making)	Replacing holistic knowledge for inputs; Seeds and knowledge as commons; Localization of decision-making; Cooperativization; Direct marketing; Value-addition at source; Decrease in food miles	Land concentration; State paternalism; Strengthening intermediaries & supermarkets; Social responsibility pleas of intermediaries; Central representatives
Price volatility, high post-harvest costs (transport, storage, retail) & undemocratic properties of large-scale food systems	Localization/Diversification; Auto-provision; Cutting out middlemen; Small-scale public stocks State as 'shield'	'Smarter trade systems'; Social responsibility pleas of intermediaries
Dependency on food imports & export crops, state revenue crises	Fair prices; Value-addition at source; National sovereignty to impose tariffs, nationalize; Odious debt cancellation (states, but also farmers)	Privatization to 'expert' multinational firms; 'Competitive advantage' strategies: Mining, timber, export crops, manufacturing; More loans; Structural adjustment
Low productivity in marginal(ised) and some traditional agroecosystems	Nutrient cycling; Stimulation of soil biota; Small-scale infrastructure development	External fertilization; Input substitution; Hybrid & GMO seeds; Large-scale infrastructure penetration
Loss of peasant livelihoods, displacement and loss of traditional knowledge, rural decay, rural-urban push migration	Revalorization of peasants/farmwork; Revalorization and utilization of traditional knowledge; Treating causes of farming health effects (due to chemicals or specific chores); Lively rural communities; Rural service access	Exit from agriculture; Absorption as farm workers; Replacement of knowledge; Migration barriers (at borders, but also internal, e.g. China's household registration system/Hukou)
High process cost barriers to green revolution and organic	Producer self-organization; Participatory research;	International loans; Land markets ('bring the land

AD	Low-cost techniques; Cooperative investment	to capital'); 'Microcredit-ization' of rural communities

5.1 The principal agent: producer organizations

The voluntary association of independent farmers has a long history of driving major agroecosystem transitions. It has powered the productivity increases in 1950s and 1960s European agriculture, the spread of organic agriculture in the 'Global North', and has been at the forefront of the development and implementation of agroecology in Latin America. In the last years, interest in producer organizations as a principal agent in AD has widened, for which the FAO's dedication of World Food Day 2012 to agricultural cooperatives is just one indicator (FAO, 2012). Many agroecologists feel that "most agricultural sustainability improvements seen in the 1990s and early 2000s have arisen *despite* existing national and institutional policies, rather because of them" (Pretty, 2008: 4 – emphasis added), and especially through the work of various forms of producer organizations.

Peasants organized in producer organizations are the principal innovators in an agroecological big push. The scope of their work naturally varies, but many potential functions have been documented:

1. **The "Union function": Connection with peasant movements; Local political voice**
    a. 'Collective bargaining': While price rises often do not trickle down to individual farmers, well-organized cooperatives usually realize them
    b. Development of agrarian citizenship and class subjectivity
    c. Assemblies as a stage for personal development, leaving-the-passive and learning-about-oneself (see Hannah Arendt's argument for council democracy in Bortolini, 2003, as well as Freire & Mellado, 1970)
    d. Organizational base for peasant movements
    e. Mutual aid through personal difficulties

2. **Collective auxiliary production – inputs, seed, value-addition**
    a. Value-addition to primary products
    b. Tools and simple machinery production
    c. Medium-scale production of soil enhancers (e.g. mycorrhizae: Naranjo, 2012))
    d. Maintenance of a seed bank or nursery, or assistance to a local farmer fulfilling these functions; Organization of seed fairs (see Ríos, 2009; Moreno et al, 2009)
    e. Small-scale biofuel production from crop residues or side crops
    f. Solar, microhydro and wind electricity production for the community (especially in decentralized energy systems & areas not connected to the grid)

3. **Service coordination**
    a. Machinery pooling
    b. Maintenance of tools and machinery
    c. Transport within the community (milk to creamery, fruits to market etc)
    d. Collective organization of grazing to better realize 'planned grazing' and pasture management strategies (Badini et al, 2007; Lipper et al, 2010; Yacouba et al, 2009; Pei et al, 2008; Lin et al, 2010)
    e. Credit intermediation
    f. Savings institution (as savings accounts or investment in cooperative businesses)
    g. Handling of bureaucratic work (environmental taxes and carbon credits; contact with sellers and buyers; research and development grants)

4. **Direct marketing without intermediary corporations**
    a. Packaging facilities
    b. Collective shipping
    c. Collective price negotiation
    d. Organizing communication with consumer organizations and fair-traders
    e. Market watch: Price reports, new crops, anticipated scarcities, development of decentral reserve systems
    f. Local market organization

5. **Farmer-to-farmer research and knowledge dissemination**
    a. Organization of research projects
    b. Stage for evaluation of local auto-innovation
    c. Horizontal knowledge dissemination via exchange between members and between organizations (Erenstein, 2003; Holt-Giménez, 2006; Rosset et al, 2011; Cuéllar & Kandel, 2005)
    d. Computer access point (to see FAO extension materials etc.)
    e. Breeding and protection of local varieties

In some cases, more than one organization can divide the tasks amongst them. Healthy competition between organizations should be encouraged, allowing members to switch to or begin a new PO without difficulties. In the past, POs have exhibited a maximum size restraint from which a big push must learn. For example: After their initial success until the 1970s, most European and North American POs have grown too large to be dynamic, horizontally-managed cooperatives and have become quasi-corporations with thousands of passive customer-members. Likewise, as discussed above, POs cannot be inoculated from the outside; their foundation must follow the producers' own conviction. Kotsonis (1999) records the failure of top-down inoculation in Tsarist Russia, a blueprint for negative outcomes ever since. Many communities will naturally wait for the first positive news from pioneering POs to make up their mind.

Organizing POs is associated with minimal costs (Holt-Giménez, 2006). This advantage over other catalysts of agrarian change (extension networks; command-transition) makes them the ideal drivers of a big push for sustainable agriculture under current conditions. When engaging the 'development realist' currents, such as the opinions of William Easterly, a big push centred on union-cooperatives is immune to the common critiques of big push strategies: Inflexibility of large planning organizations, the brutishness of central solutions, the negative effects of paternalism and ultimately the danger of an instrumentalization of reason, aid dependency, and the emergence of a 'development apparatus' or industry (as executors of national & international assistance, respectively), with its inherently undemocratic, 'outside-in' decision-making that creates spaces for corruption and often shows a low ability to scale solutions out (Stewart, 2002; Bhattacharyya, 2004; Meadowcroft, 2007). The response could in fact be that a PO-centred agroecological big push perfectly embodies Easterly's proposition that development processes should follow a bottom-up 'searcher', instead of an extrinsic 'planner' paradigm (Easterly 2006 & 2008).

Because agroecological development via producer organizations resembles the patching of a mosaic by many individual stakeholders, i.e. the collective searching and assessing of solutions, social capital formation is observed to be a valuable product of development projects within the paradigm (Bunch, 1998; Pretty, 2003; Pretty & Smith, 2004; Wu & Pretty, 2004), making them important door-openers for other programs.

5.2 The role of scientists

During the paradigm change from green revolution to agroecological development strategies, the scientist's

role has largely shifted from conducting experimental research at a central location to the facilitation and documentation of endemic research in the field (Edelman, 2009). The consequence for a big push strategy must be the opening of centralized research and extension networks to co-determined forms of knowledge formation and dissemination. In order to cultivate a systemocentric outlook on their subject, scientists can expose themselves to deep contact with farmers and agroecosystems via cohabitation stages and action research (Blanco et al, 2010; Martín, 2009; Bunch, 1982).

Although basic research (from biology to political economy) must continue to produce legitimate hypotheses for practical experimentation, the main tasks for scientists within an agroecological big push are in the documentation of successful initiatives, assistance with the set-up and analysis of farmer-experiments, and the translation of results in order to allow them to cross cultures and enter policy-making and academic dialogues (Holt-Giménez et al, 2010; Röling et al, 2004; Stigter, 2006; Leitgeb et al, 2008). Central-location institutes may have to branch out into the different regions of their country, while maintaining common administrative support. Together with PO alliances and international organizations, easily accessible, well-arranged databanks must be developed as reference tools for local innovators. These can evolve from existing systems by shifting them from exchanges of scientific articles between a small number of researchers to exchange of both auto-innovation and 'scientific' research in understandable languages(s)

5.3 The role of government

Government holds a roster of possibilities to assist POs in their country to flourish. A big push would imply the concerted use of a range of these measures.

1. Pro-peasant legislation
    a. Secure access to land on the long-term; Institute land reforms where necessary. Protection against land grabs (see Sikor, 2012).
    b. Redistribute underused public or private lands to well-organized peasant groups.
    c. Extend labour rights to the peasant and progressively implement labour standards in all steps in the food chain (Edelman et al, 2011; Via Campesina, 2009).
    d. Changes to urban law that facilitate intensive urban and peri-urban agriculture (legalization, allotment of public lands, public procurement contracts)(Bourque, 2000).
    e. Refuse to patent seeds and issue licenses for GMOs.
    f. Terminate subsidies for industrial AD that can be replaced by peasant systems (fertilizer subsidies, GMO subsidies etc).
    g. In some cases outright bans on biocides can trigger experimentation with biological pest management (Bartlett, 2005; Oka 1997; Resosudarmo, 2001).
    h. Re-analyse phytosanitary standards and abandon unfounded bias towards industrial processors.
    i. Maintain the legal framework for producer organizations, fishers' organizations, watershed management organizations and other community development organizations. Work actively with peasant organizations in policy consultation phases.
    j. Establish a strong human rights framework in law and jurisprudence.

2. Food sovereignty measures
    a. Use the possibilities within the state apparatus: procurement of food for schools, agencies, public services and army from local, sustainable farms.
    b. Protect domestic agricultural markets against dumping, hoarding and speculation (Via Campesina, 2010).
    c. Baseline price guarantees (for example via public staple-food stocks & public procurement)

3. Economic assistance to sustainable producers
    a. Build a sustainable state revenue strategy, which may be based on a small land tax as incentive for sustainable intensification and high tariffs on the export of luxury foods, agrofuels, forestry, fishery and mining products. Many critical development economists advocate for the nationalization of core industries and profitable large exporters.
    b. Incentivize local markets, direct marketing (over any distance) and small-to-medium processing, retail and restaurant businesses.
    c. Embrace the full-cost analysis paradigm in economics and support the internalization of costs in the search for real prices (Stobbelaar et al, 2009).
    d. Compensatory payments for some environmental services (e.g. Marabú-to-biochar service in Cuba (Abreu Naranjo, 2012)), funded by taxes on environmental service use[8].
    e. Credits and subsidies for specific small investments into appropriate technologies and village-scale investments in sustainable irrigation, electrification, processing etc.

4. Agronomic education and research
    a. Reorient agricultural research towards farmer-to-farmer networks, participatory research projects and research on the parameters of up-scaling. Found/assist regional experimental stations that facilitate research projects as needed and make solutions and ideas accessible. They also collect genetic resources within their region and can coordinate their exchange (Ríos, 2009).
    b. Periodically organize an agricultural census to establish the foundation for debate and research. Additionally, at least a rough carbon stock inventory (soils, vegetation) should be available.
    c. Allow rural and urban schools to educate their pupils on issues of concern for the respective communities and local ecosystems besides the national curriculum (Freire & Mellado, 1970; Kane, 2000; Schugurensky & Madjidi, 2009). Update educational materials that discriminate farming livelihoods and knowledge (White, 2012).
    d. "Change the way agronomists are trained. Agroecology and social science must play a central role in curricula, which should emphasize respect for farmer knowledge and the importance of farmer organizations (Via Campesina, 2010)." (See also: Lieblein et al, 2000; Whitmer et al, 2010; Waldenstro et al, 2008 for discussions of concrete curricula).

As a further measure, popular governments can capitalize on their power over public opinion and political culture, and assist the formation of agrarian citizenship and peasant pride, as well as ecological conscience in the urban population. They can capitalize on public means of information (public radio and TV, material published by state agencies, sponsorship of conferences and reports and even classic advertisement on public buildings & billboards) to counter the misinformation on GMOs and agricultural inputs, and the silence on alternatives.

5.4 The role of international cooperation

The central task for international actors must be to reach changes to the international trade regime. If rich country governments decide to contribute resources to a big push process, the larger part of their assistance

[8] Marabú (Dichrostachys cinerea) is an invasive shrub species inhabiting about 40% (or 900.000 hectares) of the country's pastures (Funes-Monzote, 2008). While it has some agronomic value as a protein-rich fodder shrub, many pastures have been lost entirely to it. Biochar kilns on cooperative farms would give a value to recuperating pastures and fields from marabú, and a government subsidy on the kilns could accelerate the process markedly.

can arrive in the form of forgone profits from unfair trade arrangements. With respect to the United Nations AD system, Olivier de Schutter has outlined innovations that would shift its programs and opinion-building machinery towards agroecology in his report on a 2013 mission to FAO (de Schutter, 2013; see also de Schutter, 2010).

Table 4: Possibilities for fructiferous horizontal cooperation by international actors with a country embarking on an agroecological big push

Legal assistance:

- Trade law democratization: Even though the political will to larger changes to the trade regime may be hard to find, the granting of 'loopholes' for countries that wish to make their own choices (tariffs & nascent industry subsidies) can decide over the competitiveness of whole native industries and should be a central goal for agroecology-minded policy-makers in international institutions.
- Shift from the favourable treatment of multinational corporations by government bodies (in food standards associations, subsidy guidelines, trade diplomacy, research programs and public procurement) towards POs and PO alliances that add value to their products domestically (e.g. coffee roasters in coffee-producing countries) and market directly.
- Human rights law: The Right to food; rights to common genetic resources; strictly implementing mother company responsibility for human rights' violations (Suárez Franco, 2008; Edelman & James, 2011).

Material assistance:

- Re-orientation of AD aid towards agroecological initiatives.
- Direct funding and facilitation for POs and farmer-led research projects.
- Sponsor access to scientific databases, and introduce measures against the commodification of scientific knowledge.
- Strengthen internationalist collaboration in development studies, and grant agroecology-related scholarships to international students and researchers. Shift the focus of agricultural research from conventional to sustainable systems (Vanloqueren & Baret, 2009), and encourage two-way knowledge transfers (Kristjanson et al, 2009). Terminate the close relationship of research centres & state agencies with multinational input producers.
- Cancellation of odious debt

Discussion is needed on how to derive 'fair' prices, and how to develop the dynamic mechanisms that will in the future derive them automatically. The internalization of previously externalized factor and outcome costs and benefits also helps to increase the analysability and comparability of agricultural systems (Pretty et al, 2001). A rich country government must revise its domestic subsidy schemes, disallow the dumping of domestic overproduction onto foreign markets, and use its vote in international subsidy and trade bodies (EU-CAP, WTO) accordingly. International cooperation for agroecology efforts also include a general re-framing of agriculture as an economic sector and a personal activity: the 20th century notion of a gradual loss of its importance in the industrialized economy, and the notion that agricultural work is dull, simple and detached from the spheres of human intellectual progress, must be reversed.

It is thinkable that a pioneer 'developing country' and a rich country in which the political will for sustainability has already accumulated create a partnership for close cooperation, with the aim of building a *landmark case* as an image for what agroecology can achieve on a national scale. Thereby, the central role of the 'promoter' in farmer-to-farmer networks would be scaled-up from local and regional to inter-national opinion dynamics. The 'promoter' role usually held by an individual/family would then be held by a country.

6. Agroecology and the foundational requirements for sustainable industrial development

One argument for a big push in developing agricultures has been that AD is a potent catalyst of industrial development. During the first life of the big push, this stimulation was thought to follow two general paths: On the one hand, AD would generate capital via the accumulation of productive means in the hands of capitalists or via the production of exportable goods. On the other hand, AD of small farms would 'inevitably' result in some land concentration, thereby 'freeing' labor for work in factories and state services (Ghosal, 1962). Johnston & Mellor (1961) argued that agriculture had a particular role to fulfil within the assumed national project of 'economic development', providing the larger process with food, raw materials, labour, capital, export earnings and an internal market for early industrial goods.

An agroecological big push in the coming decades must also be understood as an opportunity to build capital and prepare the grounds for sustainable development beyond agriculture (Altieri et al 2012). The pathways, however, have changed and diversified radically with the paradigm shift to agroecology:

Table 5: The agroecological big push and the facilitation of industrial development

Macroeconomics: *Influences of an agroecological big-push on the macroeconomics of industrial development*:

a) Yield gains on peasant farms decrease food import costs, thereby freeing hard currency for industrial development. The same is true for product diversification both on the farm and in processing.
b) Yield-per-labor gains are, if they are realized in a sustainable manner, the only pathway to transfer labor from the primary to the secondary and tertiary sectors. In many settings, however, they should also be used to reverse the self-exploitation and decrease working hours of farming families.
c) Resilient production of food and other basic agricultural products are a basis of societal stability and political resilience, making sustainable agro-ecologies a major 'insurance portfolio' against the break-up of communities due to climate change and rural transformation.
d) Drastic cutbacks on input use, together with the substitution of imported with domestic inputs translate directly into hard currency gains. By following this path, an agroecological big push would require far less investment in input industries (chemical input plants, tractor factories) and input transport & distribution infrastructure, freeing further resources for other realms of industrial development.
e) The creation of diverse, resilient agroecosystems via a big push allows a country to leave positions of vulnerability and dependency on one or few volatile world market prices, both for export crops and staple foods (HLPE, 2011), as well as dependency on the terms of food aid.

Microeconomics: *Pathways through which an agroecological big-push facilitates microeconomic processes at the roots of inclusive non-agricultural development:*

a) By developing and guarding strong rural communities, agroecological AD provides fertile grounds for non-agricultural development projects, which can use the organised fabric (including existing POs), cultivated 'development optimism' and relative financial wealth and stability (Cincotta, 1994; Goldschmidt & Nelson, 1978).
b) Successful farmers can accumulate small capital stocks, the basis for the creation of small businesses, both agriculture-related (in value-addition, transport and supporting services)

and beyond.

c) POs and cooperatives can accumulate medium capital stocks, the basis for small-scale industrial projects, market-support and local energy systems.
d) A potential for rural electrification via cooperative, decentralized renewable energy systems has been noted. Small-scale energy production (micro-hydro, wind, solar, biogas and biomass) is established to power cooperative processing operations, but also powers the closest village, especially after working-hours (Ilskog et al, 2005; Ross, 1972; Yadoo & Cruickshank, 2010).
e) Agroecology conserves, enhances and stabilizes crucial environmental services (water, microclimates, flood control, shade etc.), thereby creating fertile environments for other initiatives.
f) Research suggests that the prosperity of small farms and rural communities is at the core of fertility decline in countries experiencing excessive population growth, given that 1. the increase of yield-per-labor of the parents moderates the farm labor requirements to be filled by children and youth, 2. better nutrition decreases the likelihood of child deaths (and the need to prophylactically bear more children than may succumb to child mortality), and 3. stable incomes of sustainable agroecosystems mediate the argument for large families in the absence of public pension systems (Lappé & Schurman, 1988; Netting, 1993; Cincotta, 1994).
g) Enthusiasm for locally engineering appropriate technologies in agriculture and agro-processing can overflow into other economic activities, assisting in the development of appropriate processes for local industries under resource constraints (Herrera, 1981).
h) Development programs often create or foster tradition-modernity cleavages in values and dialogues, creating negative potentials in culture (from extreme traditionalism to violent modernism). The agroecological big push avoids these cleavages by embodying positive change as the fructiferous interplay between tradition and modernity and minimizing economic and cultural displacement. Traditional knowledge, techniques and cultures are recognized and collaborate with 'Western' forms of science.

As Altieri et al put it, "agroecology-based production systems […] comprise the basis of an energy, productive and food sovereignty strategy" (2011:2). While an agroecological big push nourishes early industrial development on all levels, many of its gains (rural electrification, service availability, local infrastructure etc.) themselves allow the further development of agroecosystems, creating a positive feedback-loop for broad, inclusive development.

7. Conclusions

Current agricultural regimes are still rather successfully suppressing big-push developments of ecological agriculture around the globe (McMichael, 2009). The weight of well-documented environmental, sociopolitical, technological and economic challenges to these regimes, however, will intensify during the next decades. The confluence of these challenges can be suspected to induce the political will in at least one national government to embark on a big push for agroecology. Anticipating that situation, agroecology should develop a sub-dialogue on the implications of national-scale implementation with relatively higher endowments and possibilities on the legal and executive layers. Well-researched proposals by academics would help agrarian movements express and discuss their cause in clear images and on a material basis. Even if only one such strategy were to be implemented, the effects of a 'land mark case' as a 'promoter' amongst economies should not be underestimated.

A big push through agroecology avoids many difficulties and undesirable side-effects associated with earlier

incarnations of centralized, input-dependent AD efforts on a national scale, and therefore may integrate arguments and criticisms from different 'schools' of AD thought, including many development skeptics from 'realists' to decolonial academics. Given these observations, a big-push dimension that produces national or regional case studies can increase the field's proactivity, and thus make a worthy addition to the agroecology paradigm.

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Food Sovereignty: A Critical Dialogue

INTERNATIONAL COLLOQUIUM
JANUARY 24, 2014

http://www.iss.nl/icas

FOOD SOVEREIGNTY: A CRITICAL DIALOGUE INTERNATIONAL COLLOQUIUM PAPER SERIES

A fundamentally contested concept, food sovereignty has – as a political project and campaign, an alternative, a social movement, and an analytical framework – barged into global agrarian discourse over the last two decades. Since then, it has inspired and mobilized diverse publics: workers, scholars and public intellectuals, farmers and peasant movements, NGOs and human rights activists in the North and global South. The term has become a challenging subject for social science research, and has been interpreted and reinterpreted in a variety of ways by various groups and individuals. Indeed, it is a concept that is broadly defined as the right of peoples to democratically control or determine the shape of their food system, and to produce sufficient and healthy food in culturally appropriate and ecologically sustainable ways in and near their territory. As such it spans issues such as food politics, agroecology, land reform, biofuels, genetically modified organisms (GMOs), urban gardening, the patenting of life forms, labor migration, the feeding of volatile cities, ecological sustainability, and subsistence rights.

Sponsored by the Program in Agrarian Studies at Yale University and the Journal of Peasant Studies, and co-organized by Food First, Initiatives in Critical Agrarian Studies (ICAS) and the International Institute of Social Studies (ISS) in The Hague, as well as the Amsterdam-based Transnational Institute (TNI), the conference "Food Sovereignty: A Critical Dialogue" was held at Yale University on September 14-15, 2013. The event brought together leading scholars and political activists who are advocates of and sympathetic to the idea of food sovereignty, as well as those who are skeptical to the concept of food sovereignty to foster a critical and productive dialogue on the issue. The purpose of the meeting was to examine what food sovereignty might mean, how it might be variously construed, and what policies (e.g. of land use, commodity policy, and food subsidies) it implies. Moreover, such a dialogue aims at exploring whether the subject of food sovereignty has an "intellectual future" in critical agrarian studies and, if so, on what terms.

The Yale conference was a huge success. It was decided by the organizers, joined by the Land Deal Politics Initiative (LDPI), to hold a European version of the Yale conference on 24 January 2014 at the ISS in The Hague, The Netherlands.

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The Journal of PEASANT STUDIES
critical perspectives on rural politics and development